



The Rawlins Field Office Building: A Model of Sustainability for the BLM and Wyoming

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Overview

- Team
- Location
- Mission
- Goals
- Process
- Project
- Design
- Costs
- Results
- Status



The Team



Owner

Bureau of Land Management

NSTC

Frank Ciesel, Pat Fleming

Wyoming State Office

Vickie Roseberry, Jim Kor

Rawlins Field Office

Dennis Carpenter, Kurt Kotter

**Sellards
&
Grigg, Inc.**

CONSULTING ENGINEERS/LAND SURVEYORS

**Civil Engineering and
Project Management**

Sellards & Grigg Lakewood, Colorado

Tom Roberts

Peter Nelson

Raul Rodriguez

C H A M B E R L I N
A R C H I T E C T S

Architecture

Chamberlin Architects Grand Junction, Colorado

Ed Chamberlin

Lancer Livermont

Daniel Gartner

RMH GROUP

**Mechanical/Electrical
Engineering and Energy/
Sustainability Consulting**

The RMH Group Lakewood, Colorado

Bob Stroschein

Renée Azerbegi

Tony Georgis

Kirsten Cremona

Mark Rudiger

w e n k

**Landscape
Architecture**

ASSOCIATES

Wenk Associates Denver, Colorado

Bill Wenk

Ann Abel

Walker Christensen



The Location



*Devil's
Gate
Historic
Site*



*Ferru-
ginous
Hawk*



*Sand
Dunes
(Alcova/
Seminole
Back
Country
Byway)*



*Black-
footed
Ferret*



Rawlins Field Office



*Pronghorn
Antelope*



*Pedro
Mountains*



*Mountain
Plover*



*Encamp-
ment
River*



The Mission

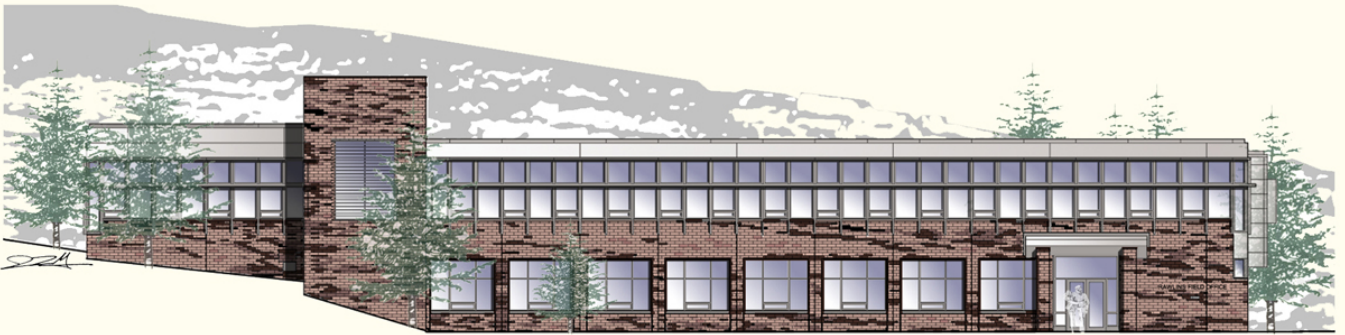
- To sustain the health, productivity, and diversity of the public lands for the use and enjoyment of present and future generations.





The Building

- 31,540 sf facility with offices, conference rooms, lab/herbarium, and support spaces





The Goals

- Initial charrette to determine goals
- LEED™ Gold Rating
 - First registered LEED™ project in Wyoming!
 - First Gold registered LEED™ project for the BLM!
- Reduce energy consumption by 30%
- Reduce water consumption by 30%





The Process

1. Initial sustainable design charrette
2. Registration of project with USGBC
3. Follow-up coordination
4. Energy modeling and check by mechanical, daylighting, and electrical (DOE2)
5. Submission of sustainable design and energy report and narratives
6. Provision of LEED™ specification in Division 1
7. Review of all specifications and designs for LEED™ compliance
8. Final energy modeling at 100% CDs
9. LEED™ documentation at 100% CDs and after construction
10. Certification of project with USGBC



The Design

- Landscape
- Civil
- Architectural
- Mechanical/Plumbing
- Electrical/Lighting
- Daylighting



Landscape Design

- No permanent irrigation system
- Maximized open space
- Minimized parking
- Roof drainage configured to water nearby plants





Landscape Design



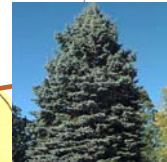
**Native
Plants**



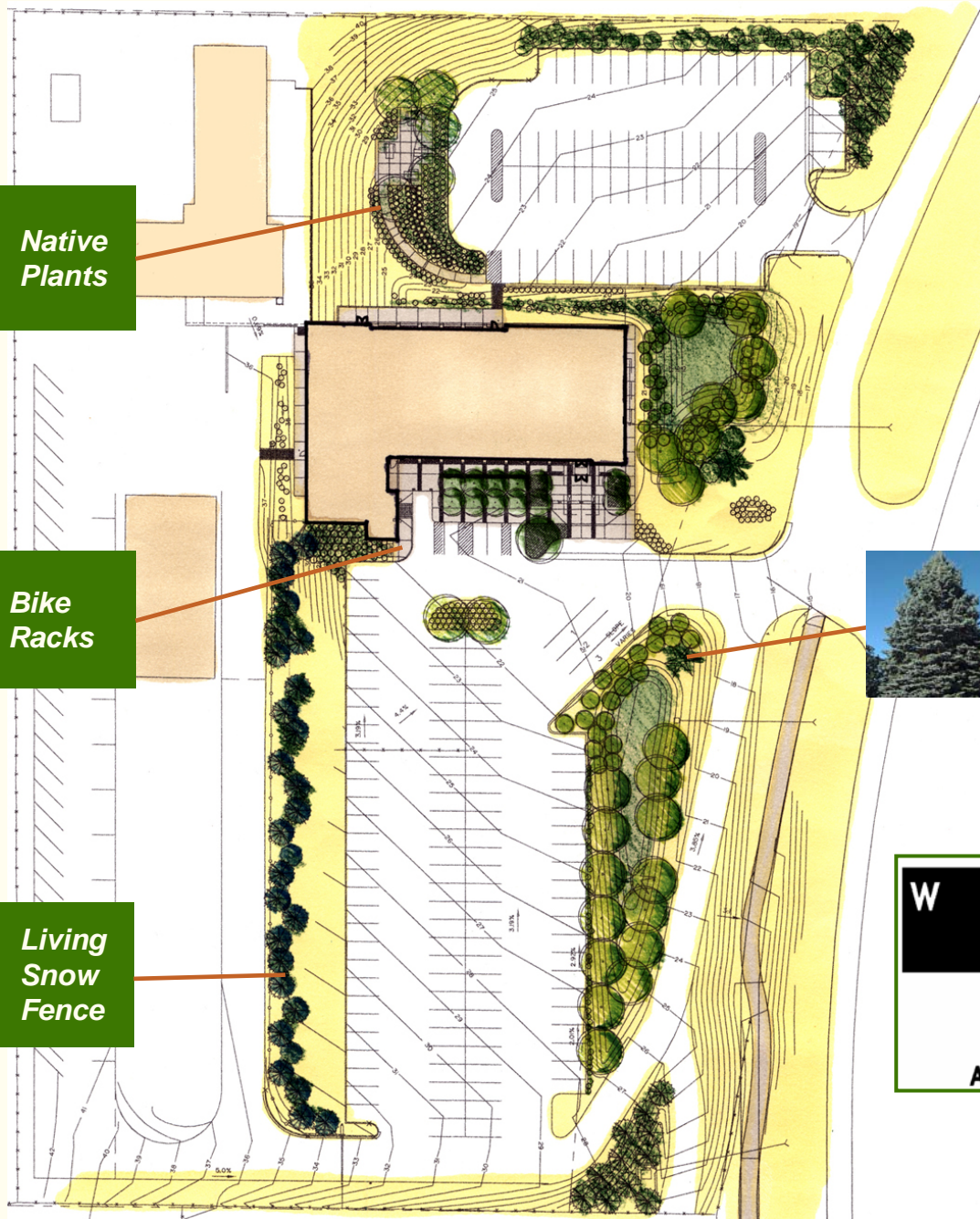
**Bike
Racks**



**Living
Snow
Fence**



**Preser-
vation of
Existing
Landscape**



w e n k
ASSOCIATES



Civil Design

- Stormwater reduction
- Stormwater treatment
- Two detention ponds, wet swales
- Erosion control plan
- Carpool area



*Straw
Bale
Sediment
Filter*



Silt Fence



*Extended
Detention
Wet Pond*

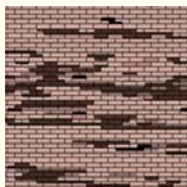
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CONSULTING ENGINEERS/LAND SURVEYORS



Architectural Design

- Masonry units selected and patterned to blend with backdrop cliff face
- High insulation levels
 - R-25 walls
 - R-30 roof
- Environmentally preferable materials
 - Recycled content
 - Locally manufactured
 - Low-VOC paints, coatings, sealants, and carpet adhesives
 - Forest Service Council certified wood



***Masonry
Echoing
Nearby
Rock
Outcrops***



***R-30
White
Roof***



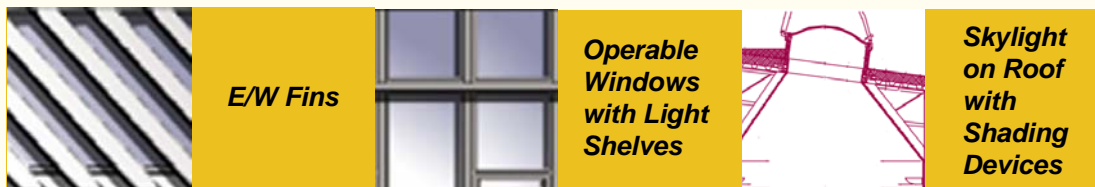
***Low-VOC
Paints,
Coatings,
and
Sealants***

C	H	A	M	B	E	R	L	I	N
·	·	·	·	·	·	·	·	·	·
A	R	C	H	I	T	E	C	T	S



Architectural Design

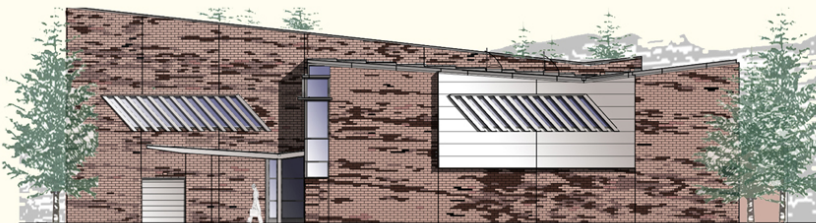
- East/west axis orientation
- Extensive shading
 - Fins, light shelves, overhangs
 - E/W shades allowing 95% of winter sun and shading all but 35% of summer sun
- Skylights with manually operating shading devices
 - Shading hot summer sun
 - Concentrating winter sun
- High-performance, operable windows selected for orientation and height



C	H	A	M	B	E	R	L	I	N
·	·	·	·	·	·	·	·	·	·
A	R	C	H	I	T	E	C	T	S



Architectural Design



C	H	A	M	B	E	R	L	I	N
·	·	·	·	·	·	·	·	·	·
A	R	C	H	I	T	E	C	T	S



Mechanical and Plumbing Design

- 100% indirect-direct evaporative cooling
- No HCFC or CFC usage
- 85% efficient hot water boiler
- Humidity, temperature, and carbon dioxide monitoring and control
- Ultra-low-flow urinals
- Low-flow toilets
- Tamper-proof faucet aerators on sinks and lavatories



***High-
efficiency
Boiler***



***100%
Indirect/
Direct
Evaporative
Cooling***



***Ultra-low-
flow Urinals***



***Lavatories
with Low-
Flow
Restrictors***

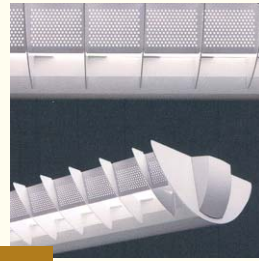


Electrical and Lighting Design

- 20 kW wind turbine
- Light pollution reduction
- High-efficiency direct/indirect lighting
- Lighting controls



20 kW On-site Wind Generation



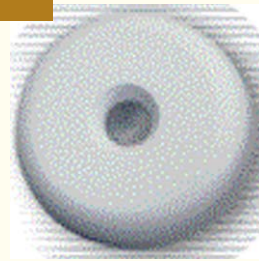
Direct/Indirect Lighting with Dimming Ballasts



Light Pollution Reduction (Full-cutoff lighting)



Occupancy Sensor



Daylighting Photosensor



Wind Turbine Design

- NREL and BLM study “Assessing the Potential for Renewable Energy on Public Lands” found the wind energy potential of the BLM Rawlins planning unit to be one of the top six sites studied.
- Wind speeds are often in excess of 15 mph (average 11.4 mph, maximum 44 mph).
- Originally two 20 kW wind turbines were selected.
- Pacific Power and Light has a maximum net metering limit of 25 kW. If ≤ 25 kW, utility pays net metering rate (\$0.034 per kWh). If > 25 kW, building is considered a “Qualifying Facility” and utility only pays wholesale buy-back rate (\$0.016 per kWh).
- Reduced to one 20 kW wind turbine.
- Worked with Aerofire Windpower out of Denver to select optimal design and site location.
- Worked with NREL to determine annual energy usage





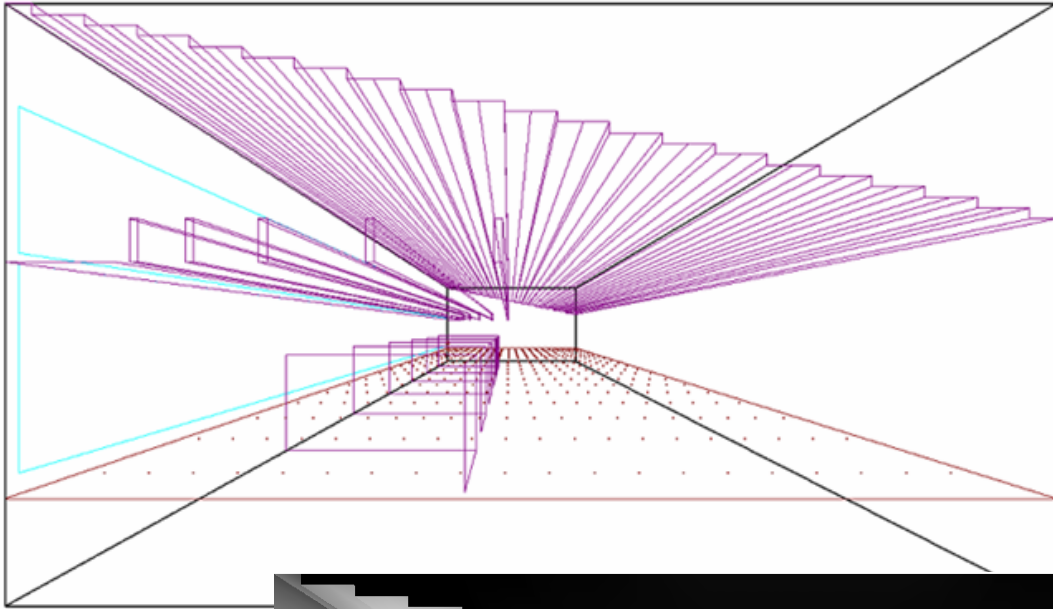
Daylighting Design

- Open plan office on exterior zones with enclosed offices on interior
- Glazing type and area selected for orientation and height
- High sloped ceilings
- Light colored ceilings
- Light shelves
- Shading devices
- Building orientation for optimum northern daylight and minimized east and west daylight
- Photosensors and dimmable lighting ballasts
- Computer modeling

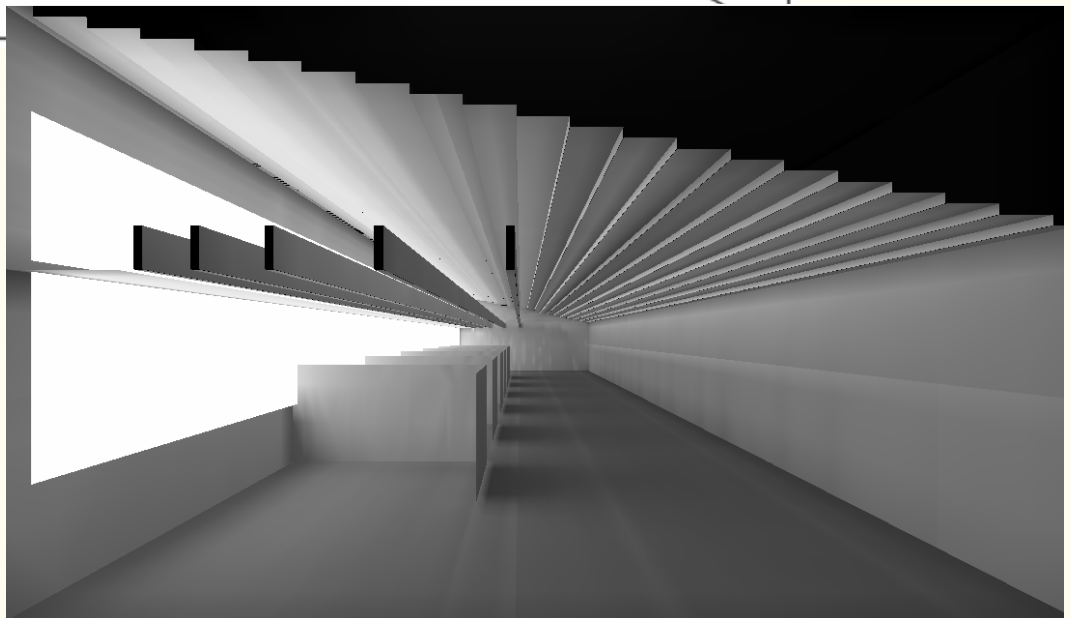




Daylighting Model



Wire
Frame



Rendering



LEED™ Scorecard

44		25	Total Project Score	
Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 to 60 points				

8		6	Sustainable Sites	Possible Points	14
Y	?	N			
Y			Prereq 1	Erosion & Sedimentation Control	
1			Credit 1	Site Selection	1
		1	Credit 2	Urban Redevelopment	1
		1	Credit 3	Brownfield Redevelopment	1
		1	Credit 4.1	Alternative Transportation , Public Transportation Access	1
1			Credit 4.2	Alternative Transportation , Bicycle Storage & Changing Rooms	1
		1	Credit 4.3	Alternative Transportation , Alternative Fuel Refueling Stations	1
1			Credit 4.4	Alternative Transportation , Parking Capacity	1
1			Credit 5.1	Reduced Site Disturbance , Protect or Restore Open Space	1
		1	Credit 5.2	Reduced Site Disturbance , Development Footprint	1
1			Credit 6.1	Stormwater Management , Rate and Quantity	1
1			Credit 6.2	Stormwater Management , Treatment	1
		1	Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands , Non-Roof	1
1			Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands , Roof	1
1			Credit 8	Light Pollution Reduction	1

4		1	Water Efficiency	Possible Points	5
Y	?	N			
1			Credit 1.1	Water Efficient Landscaping , Reduce by 50%	1
1			Credit 1.2	Water Efficient Landscaping , No Potable Use or No Irrigation	1
		1	Credit 2	Innovative Wastewater Technologies	1
1			Credit 3.1	Water Use Reduction , 20% Reduction	1
1			Credit 3.2	Water Use Reduction , 30% Reduction	1

9		8	Energy & Atmosphere	Possible Points	17
Y	?	N			
Y			Prereq 1	Fundamental Building Systems Commissioning	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	CFC Reduction in HVAC&R Equipment	
2			Credit 1.1	Optimize Energy Performance , 20% New / 10% Existing	2
2			Credit 1.2	Optimize Energy Performance , 30% New / 20% Existing	2
2			Credit 1.3	Optimize Energy Performance , 40% New / 30% Existing	2
		2	Credit 1.4	Optimize Energy Performance , 50% New / 40% Existing	2
		2	Credit 1.5	Optimize Energy Performance , 60% New / 50% Existing	2
1			Credit 2.1	Renewable Energy , 5%	1
1			Credit 2.2	Renewable Energy , 10%	1
		1	Credit 2.3	Renewable Energy , 20%	1
		1	Credit 3	Additional Commissioning	1
1			Credit 4	Ozone Depletion	1
		1	Credit 5	Measurement & Verification	1
		1	Credit 6	Green Power	1





LEED™ Scorecard

4 9 Materials & Resources Possible Points 13

Y	?	N			
Y			Prereq 1	Storage & Collection of Recyclables	
		1	Credit 1.1	Building Reuse , Maintain 75% of Existing Shell	1
		1	Credit 1.2	Building Reuse , Maintain 100% of Existing Shell	1
		1	Credit 1.3	Building Reuse , Maintain 100% Shell & 50% Non-Shell	1
		1	Credit 2.1	Construction Waste Management , Divert 50%	1
		1	Credit 2.2	Construction Waste Management , Divert 75%	1
		1	Credit 3.1	Resource Reuse , Specify 5%	1
		1	Credit 3.2	Resource Reuse , Specify 10%	1
1			Credit 4.1	Recycled Content , Specify 25%	1
1			Credit 4.2	Recycled Content , Specify 50%	1
1			Credit 5.1	Local/Regional Materials , 20% Manufactured Locally	1
		1	Credit 5.2	Local/Regional Materials , of 20% Above, 50% Harvested Locally	1
		1	Credit 6	Rapidly Renewable Materials	1
1			Credit 7	Certified Wood	1

14 1 Indoor Environmental Quality Possible Points 15

Y	?	N			
Y			Prereq 1	Minimum IAQ Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Carbon Dioxide (CO₂) Monitoring	1
		1	Credit 2	Increase Ventilation Effectiveness	1
1			Credit 3.1	Construction IAQ Management Plan , During Construction	1
1			Credit 3.2	Construction IAQ Management Plan , Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials , Adhesives & Sealants	1
1			Credit 4.2	Low-Emitting Materials , Paints	1
1			Credit 4.3	Low-Emitting Materials , Carpet	1
1			Credit 4.4	Low-Emitting Materials , Composite Wood	1
1			Credit 5	Indoor Chemical & Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems , Perimeter	1
1			Credit 6.2	Controllability of Systems , Non-Perimeter	1
1			Credit 7.1	Thermal Comfort , Comply with ASHRAE 55-1992	1
1			Credit 7.2	Thermal Comfort , Permanent Monitoring System	1
1			Credit 8.1	Daylight & Views , Daylight 75% of Spaces	1
1			Credit 8.2	Daylight & Views , Views for 90% of Spaces	1

5 Innovation & Design Process Possible Points 5

Y	?	N			
1			Credit 1.1	Innovation in Design , Snow Removal	1
1			Credit 1.2	Innovation in Design , Educational Displays	1
1			Credit 1.3	Innovation in Design , Shading Devices	1
1			Credit 1.4	Innovation in Design , Stormwater Management	1
1			Credit 2	LEED™ Accredited Professional	1





Energy Modeling Options

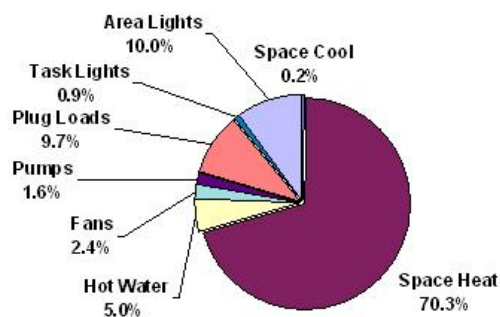
- eQuest (DOE2.2) modeling program used to select appropriate design
- Energy modeling options examined:
 - Architectural System 1: Shading (medium and high levels of shading)
 - Architectural System 2: Daylighting
 - Architectural System 3: Insulation (medium and high levels of insulation)
 - Architectural System 4: Efficient windows
 - Mechanical System 1: Ground source heat pumps
 - Mechanical System 2: Indirect-direct evaporative cooling with boiler and variable-air-volume system
 - Mechanical System 3: Efficient chiller and boiler with variable-air-volume system



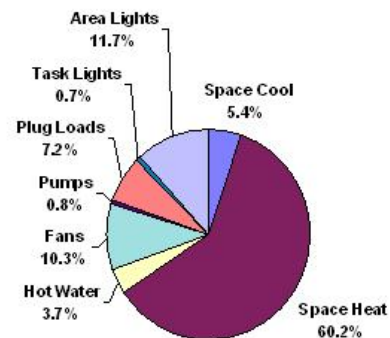
Operational and Energy Savings

	ASHRAE Base Case	Design Case	Design Case with Wind
Energy Cost	\$21,309	\$12,790	\$11,528
Energy Cost Index	\$0.68/sf	\$0.41/sf	\$0.37/sf
→ <i>Reduction from Base Case</i>	—	40.0%	45.9%
Gas Usage	1,503 MMBtu	1,303 MMBtu	1,303 MMBtu
Electricity Usage	248.1 MWh	93.7 MWh	56.9 MWh
Peak Demand	114.1 kW	56.2 kW	56.2 kW
Energy Use Index	74.5 kBtu/sf	51.4 kBtu/sf	47.5 kBtu/sf
→ <i>Reduction from Base Case</i>	—	31.0%	36.3%

Design Case
Total Annual Energy Usage
(51.4 kBtu/sf/yr)



Base Case (Energy Cost Budget)
Total Annual Energy Usage
(74.5 kBtu/sf/yr)





Quantifiable Savings

- 46% reduction in annual energy costs including savings from wind power
- 36% reduction in annual energy usage including savings from wind power
- 31% reduction in water use
- 44 out of 69 points being pursued; only 39 points required for LEED™ Gold rating!
- Wind power advantages
 - Offsets electrical energy usage by 40% and saves \$1,260 per year based on research by NREL's National Wind Technology Center.
 - Earns two out of three LEED™ points possible for renewable energy credits.



LEEDTM Costs vs. Standard Costs

Rawlins Final Cost Estimate*	\$4,453,946
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Rawlins Estimated Cost per Square Foot	\$141
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Standard Cost per Square Foot**	\$113
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Annual Energy Savings	\$9,781
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* *Excludes site and demo work.*

** *From Means Square Foot Costs 2004 catalog.*



Construction Costs

Item	Premium
Cooling (100% indirect-direct evaporative)	\$\$
On-site Power Generation (20 kW of wind power)	\$\$
Recycled Content Materials	0
Local Materials	0
Sustainably Harvested Wood Products	\$
White Roof	\$
DDC to Monitor Humidity, Temperature, CO ₂	\$
Efficient Heating System	0
Ultra-low-flow Water Fixtures	\$
High Levels of Insulation (R-25 walls, R-30 roof)	\$
High-efficiency Lighting	0
High-performance Windows	\$\$
Extensive Daylighting (lightselves, skylight, external shading)	\$\$
Storm Water Management/Treatment	0
Native Plants	0
Living Snow Fence	0
Minimized Light Pollution	0
Bicycle Racks	\$

0 *No Cost Premium*

\$\$ >\$25K / <\$50K

\$ <\$25K

\$\$\$ >\$50K / <\$100K



Design and Consulting Costs

LEED™ Consulting/Energy Modeling	\$35,000
Architectural Design Premium	\$18,000
Construction Services Premium	\$15,000
Commissioning	\$30,000
LEED™ Registration Fee	\$750
LEED™ Certification Fee	\$1,500



Status



- Project under construction and estimated to be complete in July 2005.





The End

That's All Folks!
Thank you!

For more information, please contact:

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